POTENTILLA ULIGINOSA (ROSACEAE: ROSOIDEAE), A NEW PRESUMED EXTINCT SPECIES FROM SONOMA COUNTY, CALIFORNIA

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ABSTRACT

Potentilla uliginosa is proposed for a localized endemic, presumed extinct, formerly known from the oligotrophic Cunningham Marsh near Cunningham in Sonoma County, California. The new species belongs to a morphologically and ecogeographically defined species cluster in sect. *Multijugae* (Rydb.) A. Nelson that also includes *P. hickmanii* Eastwood, *P. millefolia* Rydb., *P. multijuga* Lehm., and *P. plattensis* Nutt. It differs from the two other species of coastal California, *P. multijuga* (also presumed extinct) and *P. hickmanii* (federally and state endangered) in its more deeply incised leaflets (70–90% to midrib in *P. uliginosa*, vs. 30–40% in *P. multijuga* and 50–65% in *P. hickmanii*), and additionally from the latter in longer stems (2.5–5.5 vs. 0.5–2.5 dm) and leaves (15–32 vs. 3–17 cm), and leaflets that are irregularly pinnately divided rather than palmately divided or flabelliform.

RESUMEN

Se propone **Potentilla uliginosa** para un endemismo localizado, presumiblemente extinto, conocido previamente de la oligotrófica Cunningham Marsh cerca de Cunningham en el condado de Sonoma, California. La nueva especie pertenece a un grupo de especies definidas morfológica y ecogeográficamente de la sect. *Multijugae* (Rydb.) A. Nelson que también incluye *P. hickmanii* Eastwood, *P. millefolia* Rydb., *P. multijuga* Lehm., y *P. plattensis* Nutt. Difiere de las otras dos especies de la costa de California, *P. multijuga* (también presumiblemente extinta) y *P. hickmanii* (en peligro a nivel federal y estatal) por sus foliolos más profundamente incisos (70–90% del nervio central en *P. uliginosa*, vs. 30–40% en *P. multijuga* y 50–65% en *P. hickmanii*), y además, de esta última por sus tallos más largos (2.5–5.5 vs. 0.5–2.5 dm) y hojas (15–32 vs. 3–17 cm), y foliolos que son irregularmente pinnados en vez de palmados o flabeliformes.

KEY WORDS: Rosaceae, Potentilla, Cunningham Marsh, California, new species, conservation, extinct species

In 1946 and 1947, Milo S. Baker and John Thomas Howell evidently made joint collecting trips to an area referred to in Baker's field book as "Joe Cunningham Marsh Campground," near the town of Cunningham in Sonoma County, California. Among the plants they collected was a *Potentilla*, possibly representing the same population as a collection by Joseph W. Congdon from "Sebastopol to Stony Point Road, Analy Township" in 1880 (GH, MIN). Baker and Howell identified the *Potentilla* as *P. hickmanii* Eastwood, which had otherwise been known only from two stations in Monterey and San Mateo counties (Jepson 1936). This identification was adopted in subsequent state and regional floras (e.g., Best et al. 1996; Munz 1959; Rubtzoff 1953).

While revising *Potentilla* sect. *Multijugae* (Rydb.) A. Nelson as his doctoral thesis (Johnston 1980), incorporating numerical analyses of twenty morphological characters, the senior author concluded that the Sonoma County population was distinct from populations of *P. hickmanii* in Monterey and San Mateo counties. The Sonoma County population differed in having longer stems (2.5–5.5 vs. 0.5–2.5 dm) and leaves (15–32 vs. 3–17 cm), and leaflets that were irregularly pinnately divided (rather than palmately divided or flabelliform). Instead, he found the closest morphological comparison to *P. plattensis* Nutt., a species with regularly pinnately divided leaflets occurring in wet meadows and sloughs from the plains of Alberta and Manitoba sporadically south to the southern Rocky Mountains in northern New Mexico and Arizona. He also noted similarities to *P. multijuga* Lehm., an apparently extinct species from southern California with comparable habitat, habit, and stature but with fewer (7–17 vs. 17–21[–25]) and much more shallowly divided leaflets (30–40% vs. 70–90%). In his thesis (Johnston 1980), the senior author described the Sonoma County plants as a new species (*P. uliginosa*), but he annotated the specimens as a new variety of *P. hickmanii*. For various reasons, however, formal publication at either species or varietal rank was postponed.

In 1987, the junior author tried to relocate the ambiguous *Potentilla* in Cunningham Marsh, without success. As a result, she retained the plants within *P. hickmanii* in her revision of the genus for California (Ertter 1993a), albeit with the note "may warrant recognition." She also discussed the taxonomic quandary in an overview of the species complex (Ertter 1993b). In the process of preparing updated treatments for California and *Flora of North America North of Mexico,* however, she decided that the distinctions between the Cunningham Marsh plants and *P. hickmanii* s.s. were too significant to overlook. Formal publication of the Sonoma County population is accordingly presented here.

Potentilla uliginosa B.C. Johnston & Ertter, sp. nov. (**Fig. 1**). TYPE: U.S.A. CALIFORNIA. Sonoma Co.: ca. 1 mi (airline) SW of Cunningham Station in Cunningham Marsh, 26 Jun 1947, *Milo S. Baker 11831* (HOLOTYPE: UC 963929; ISOTYPES: CAS, RSA, UC 972187 [erroneously written as *10831*, which is a collection of *Crepis* according to Baker's field notes]).

Planta perennis elata caulibus erectis 25–55 cm longis, e caudice crasso verticali non ramoso plerumque unicipiti fuscis stipularum petiolorumque emortuarum dense vestito, in aspecto plerumque stramentosa. Caules petiolaque graciles, incavi, ferruginei, glabrati vel obscure sparseque strigosi. Folia radicalia erecti, rhachide 21–25(–29) cm longa, folioliis 17–21(–25) verticillatis pinnatis, 40–60% rhachidis occupantis. Foliolum terminale pinnatim profunde in segmenta longa angusto-lanceolata divisum. Foliola demissiora similiter pinnatim divisa; foliola demississima palmatim divisescentes; omnes foliolorum segmentis 7–10 angusto-lanceolatis 70–90% ad costam incisi, sparse ad uniformiter utrinque strigosi sed obscure, in aspecto virides glabrescentesque. Caules, stipulis medicaulinis 11–16 mm longis 4–5 mm latis plerumque divisis, floribus 6–10 in pedicellis recurvatis tempore fructificantis. Calyx 9 mm altus (lobis inclusis), moderate vel dense strigosus, lobis lanceolatis brevi-acuminatis, bracteolis ovatis lobis 0.7–1.0–plo longioribus. Stamina 20, antheris 0.7–0.9 mm longis in filamentis 1.5–2.8 mm longis. Pistilla ca. 20; stylis 2.7–3.6 mm longis, filiformibus, e basi leviter angustatis, stigmatibus conspicuis papillosis rubiginosis capitatis. Achaenia 2.0–2.6 mm longa, viridula, laevia. Habitat solum in paludo uliginosa maritima prope Cunningham in California.

Stems 2.5–5.5 dm tall, from a thick vertical unbranched rootstock, the usually solitary root-crown covered with the dark red-brown remains of previous seasons' stipules, which often remain attached to their petioles, giving the caudex a thatched look; stems and petioles thin, reddish-brown, glabrous to sparsely and obscurely strigose. **Basal leaves** pinnate, 15–32 cm long, 2–4 cm wide: rachis 21–25(–29) cm long; leaflets (13–)17–21(–25), irregularly paired, somewhat verticillate, occupying 40–60% of the rachis; largest leaflets cuneate to flabellate, 1.2–2.2 cm long, distal leaflets ± pinnately or irregularly divided, proximal leaflets ± palmately divided, into (3–)7–10(–15) narrowly oblanceolate to linear segments cutting 70–90% to midrib, sparsely to uniformly strigose on both surfaces but always obscurely so, appearing green and glabrescent to the naked eye; terminal leaflet indistinct, lobed and/or confluent with adjacent lateral leaflets. **Cauline leaves** 2; stipules 11–16 mm long and 4–5 mm wide, usually divided. **Inflorescences** open, 6–10-flowered; pedicels 1–6 cm long, recurved in fruit. **Flowers:** calyx 9 mm high (including sepalar lobes), moderately to densely strigose; epicalyx bractlets ± lanceolate, 4–6 mm long, 1–2.5 mm wide, 0.7 as long as the sepalar lobes or longer; sepalar lobes ovate, 4–7 mm, acute; petals 6–10 mm long, 5–8 mm wide, bright yellow; stamens 20, filaments filiform, (1.5–)2–2.8 mm long, anthers 0.7–0.9(–1.2) mm long; pistils ± 10–20, styles 2.7–3.6 mm long, filiform and very slightly tapered from the base, stigma capitate, conspicuously papillose, red-brown. **Achenes** 2.0–2.6 mm long, light-green, smooth, ± carunculate.

Ecology, phenology, and status.—Permanent oligotrophic wetlands, 30–40 m elev. Flowering May to August. Presumed extinct.

Etymology and vernacular name.—From Latin *uliginosus*, marshy, in reference to the habitat. Cunningham Marsh cinquefoil is the obvious vernacular name.

Conservation status.—*Potentilla uliginosa* is apparently known from only three collecting events, all possibly from the same site: by Congdon in 1880 and by Baker and Howell in 1946 and 1947. Baker's field notes augment the specimen label data: "Cunningham Marsh within the fence of the Campground about 1.5 mi west of town of Cunningham on ranch owned by Mr. Voight." Although a cinquefoil identified as *P. hickmanii* was noted on a 1990 survey of the Cunningham Marsh conservation easement site (Baye 2005), no voucher is known. Subsequent surveys failed to confirm the species' continued existence (Baye 2005), and the plant (as *P. hickmanii*) is accordingly noted as "Presumed extinct in the county" in the Sonoma County flora (Best et al. 1996). A conservation plan is nevertheless proposed by Baye (2005) for "*Potentilla*

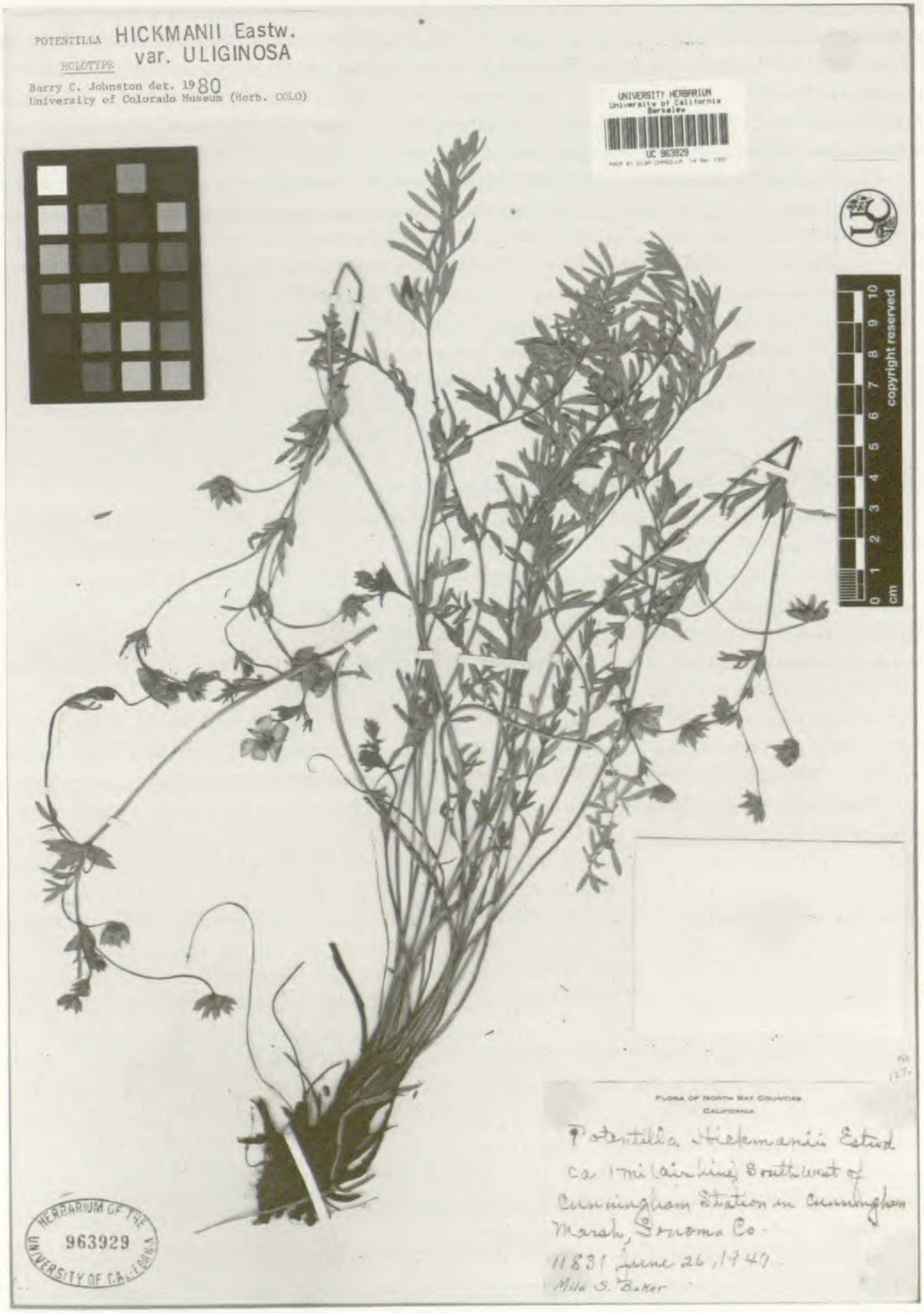

Fig. 1. Holotype specimen of *Potentilla uliginosa*, University Herbarium, University of California at Berkeley (UC 963929).

sp. (nominal *P. hickmanii*)," in the event that living plants are rediscovered or "recruited from a (hopefully) dormant persistent seed bank." It is also possible that additional populations remain to be discovered in the mountains of northwestern California. Tantalizing in this regard is a 1929 collection (*Applegate 5735*, UC) identified as *P. millefolia* Rydb. from Deer Creek near Selma, Josephine County, Oregon, which approaches *P. uliginosa* in stature and occurs outside the otherwise known range of *P. millefolia* (i. e., meadows from south-central Oregon to the east side of the Sierra Nevada in California and Nevada).

Cunningham Marsh itself is one of three perennial wetland complexes in southern Sonoma County that share a suite of disjunct, endemic, and regionally rare wetland species (Baye 2005; Best et al. 1996; Rubtzoff 1953), the other two being Pitkin Marsh and the lesser known Perry Marsh. All three are relatively oligotrophic (acidic and nutrient-poor) with permanent fen-like water systems (Baye 2005). As such, they harbor numerous disjunct species more characteristic of northern bog-like habitats, leading Rubtzoff (1953) to interpret the marshes as relictual floristic "islands." The main "poster-child" plant is the federally endangered Pitkin Marsh lily (*Lilium pardalinum* Kellogg subsp. *pitkinense* (Beane & Vollmer) M.W. Skinner), which is endemic to Pitkin and Cunningham marshes. While more conservation attention has been paid to Pitkin Marsh, which has the largest number of significant species, a conservation easement was established in Cunningham Marsh in 1998, in response to a proposed subdivision on adjacent lands (Baye 2005). Whether the easement site includes the historical locality of *P. uliginosa*, or whether that locality has already been converted to agricultural uses or subdivisions, has yet to be determined.

Plant species that are presumed extinct are more commonly described in the paleobotanical literature, and the unavailability of living or recently collected material of *Potentilla uliginosa* has hampered the kind of studies (e.g., molecular analysis, common garden experiments) that would otherwise be appropriate for taxonomic recognition of morphologically anomalous plants known from single populations. The morphological anomalies are nevertheless sufficient in their own right to justify recognition of the Cunningham Marsh cinquefoil as a distinct species. This action clarifies conservation efforts not only of *P. uliginosa* but also *P. hickmanii*, which is endangered under both federal regulations (Clark 1998) and California state regulations (California 2004). In particular, formal recognition of *P. uliginosa* supports the strong recommendation in the Cunningham Marsh conservation easement area management plan (Baye 2005) against "nominal reintroduction" efforts using *P. hickmanii* from San Mateo or Monterey counties.

Relationships.—Potentilla uliginosa is a distinctive species that belongs to a morphologically and ecogeographically defined species cluster in *Potentilla* sect. *Multijugae* that also includes *P. hickmanii*, *P. millefolia*, *P. multijuga*, and *P. plattensis*. As already noted, the new species has heretofore been included within *P. hickmanii*, differing most notably in its larger dimensions (e. g., stems 2.5–5.5 dm vs. 1.5–2.5 dm). The leaflets of *P. uliginosa* are more comparable to those of *P. millefolia* and *P. plattensis* in being divided 70–90% to the midrib into (3–)7–10(–15) narrowly oblanceolate to linear segments (vs. divided only 50–65% to midrib into 2–5 somewhat broader segments in *P. hickmanii*). In contrast to the irregularly pinnate leaflets of *P. uliginosa*, those of *P. millefolia* tend to be palmately lobed, while those of *P. plattensis* are more regularly pinnately lobed, with the terminal leaflet relatively distinct from (vs. confluent with) the lateral leaflets. Plants of *P. uliginosa* tend to be larger (2.5–5.5 dm vs. 0.5–2.5 dm) than either *P. millefolia* or *P. plattensis*, and are rather in the size range of *P. multijuga* (2.0–3.5 dm). *Potentilla multijuga* also differs from *P. uliginosa* in having fewer leaflets (7–17 vs. [13–]17–21[–25]) that are more shallowly incised (only 30–40% to the midrib). Likewise presumed extinct, *P. multijuga* is known only from a handful of collections in the 1890's from Ballona Marsh near the current site of Los Angeles International Airport in Los Angeles County, California. The name *P. multijuga* has been proposed for conservation with a conserved type (Ertter & Reveal 2008), since the original type has proven to be *Horkelia cuneata* Lindl. (Soják 1996).

As previously hypothesized (Ertter 1993b), the species cluster to which *Potentilla uliginosa* belongs has evidently radiated among seasonally or permanently saturated wetlands of western North America, resulting in numerous isolated populations. Some of these populations have speciated into narrow endemics, including species that are federally and state endangered (*P. hickmanii*), candidates for federal listing (*P. basaltica*

Tiehm & Ertter), or presumed extinct (*P. multijuga, P. uliginosa*). Several other anomalous populations may prove distinct upon further analysis, notably an outlier of *P. millefolia* in Reese River Valley in Lander County, Nevada. In our understanding, the recently described *P. diversifolia* Lehm. var. *madsenii* S. L. Welsh & N. D. Atwood, reported from a single collection from Kane County, Utah (Welsh et al. 2008), also belongs to this complex as a variant of *P. plattensis*; it is currently on the "Need Data List" for the Rare Plants of Utah (Utah Native Plant Society Rare Plant Committee 2009). Molecular analyses of the complex are currently underway by Matt Guilliams, a graduate student at the University of California at Berkeley.

Additional collections examined: **U.S.A. California: Sonoma Co.:** Sebastopol and Stony Point Road, Analy Township, 16 May 1880, *J. W. Congdon s.n.* (GH, MIN); Cunningham Marsh within the fence of the "Camp Ground," ca. 1.5 mi W of the town of Cunningham, 17 Aug 1946, *M.S. Baker 11550* (CAS, RSA); Cunningham Marsh ca. 1 mi W of Cunningham, 17 Aug 1946, *J.T. Howell 22861* (CAS, US); Cunningham Marsh, 26 Jun 1947, *J.T. Howell 23297* (CAS, NY).

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